'A WHOLE NEW WAY OF USING COMPUTERS'

THAT'S THE PROMISE AND THE POWER OF HYPERTEXT, SAY THREE OF ITS PIONEERS

BY SHERRIE VAN TYLE

WHEN TED NELSON coined the term hypertext 25 years ago, the idea of nonlinear writing sparked more enthusiasm in computer science classrooms than in corporate boardrooms. Still, he and two other hypertext pioneers, Douglas Englebart and Andries van Dam, persisted, eventually devising a number of early hypertext systems. But the hypertext concept is a much larger web of interconnections than these pioneering efforts suggest. And it is bringing on a renaissance in how we work and live.

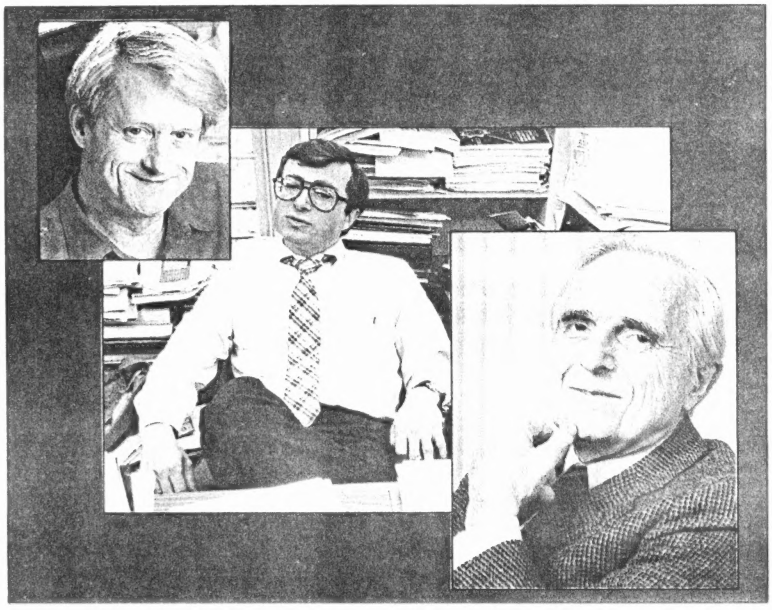
"This new method of handling data—by its power and by the fact that everyone needs it in every field for everything—will be the foundation of a whole new way of using computers," says Nelson, whose title at Autodesk Inc., Sausalito, Calif., is distinguished fellow. "Some people treat it as radical and strange and new. I don't, because I've been working on it for 29 years. To me word processing is radical and strange and stupid because it doesn't acknowledge the way things should have been all along—which is interconnected."

Hypertext's appeal is that it more closely aligns with human thinking than conventional computing. Says van Dam, who teaches at Brown University in Providence, R.I., "Books are linear, but we don't think linearly. We keep all of these associations in our heads. When we see something or eat or listen to music, any number of thoughts come floating into our heads. Hypertext is computer support for this nonlinearity."

To Nelson, van Dam, and Englebart, who directs the Bootstrap Project at Stanford University, the hypertext products on the market today are embryonic compared with the systems that are possible. "Existing hypertext packages are fairly trivial," Nelson says. Nonetheless, "I'm fascinated by how the hypertext notion has caught on."

The big interest in hypertext now contrasts with the cool reception it got from industry for most of its history. "The idea of hypertext has been a very long time in coming to commercial realization," says van Dam. "The basic ideas have been around since Vannevar Bush published an article on 'memex' in 1945 and Ted Nelson started writing about hypertext in the mid-'60s."

The very nature of computer architectures and operating systems were partly to blame. "We have this notion, which is both a curse and a blessing,



FOUNDING FATHERS

The hypertext systems of today only hint at the potential, according to Ted Nelson, Andries van Dam, and Douglas Engelbart (l-r).

of backwards-compatibility and that leads to an undue preoccupation with preserving the past," van Dam says. "Because we had the alphanumeric cursor-key mind set, the industry as a whole did not move quickly enough to bit-mapped graphics and what is called the WIMP interface—windows, icons, menus, and multiple processes." This concept was fully developed in the 1970s by Xerox Corp. researchers. Apple Computer Inc.'s Macintosh was the first commercially successful computer to adopt it.

Englebart recalls demonstrating the On Line System he developed at the Stanford Research Institute in the 1960s. "We would usually get a polite and sometimes a not-so-polite rejection. It's as if the system didn't belong in the world." That world was dominated by IBM Corp.'s "character-terminal time-sharing world," van Dam points out. Hypertext was alien to that world and to DOS, which evolved from it, Englebart says. "Many executives were reluctant to buy hypertext systems. They wondered if our system was so great, then why didn't Digital Equipment or IBM have them?"

NOW THAT GLACIAL PACE of acceptance is picking up as word of hypertext's virtues spreads. A big part of its allure is easier access to data—the promise of links to data bases as large as the Library of Congress. But hypertext's communal aspects—that many users can work on the same project, for example—loom large in the workplace and in society.

To link hypertext users, better networking will be needed, says van Dam, pointing to the importance of wireless networks like the one from Agilis Corp. [*Electronics*, July 1989, p. 36]. For his part, Englebart has believed all along that computers must be networked. Linking users via networks and hypertext will bring benefits that extend beyond the workplace. "What kept me going all these years is to see how much improvement I could help make to help mankind deal with issues of complexity and urgency," he says.

In agreement is Nelson, who says, "It's time for humanity to get very smart very quickly or there won't be any human beings in the year 2100. The ability to share information deeply with all the interconnections and all the differences so that we can negotiate sincerely and in depth over all the complex issues in the future is absolutely vital to our survival."

Still, it takes time for users and industry to adjust to new ways of computing. "We are dealing with cultural inertia," Englebart says. "Looking ahead, it will take a long time for an organization to learn how to harness new capability." This will be especially important in hypertext-based group projects, he says, where "everyone who is collaborating has to shift in synchronism into the new world."

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Just as hypertext is reshaping the notion of software as a shared resource, the computing hardware will look different, too. To Englebart, the idea of a computer, even one that's handheld or notebook size, is itself anachronistic. The hardware exists only as a user's portal into an extended domain of shared resources, he explains.

What is important is that the portal will keep shrinking. With rapidly advancing telecommunications, "the portal could even be in our eyeglasses," Englebart says.

Nearer term, hypertext is a natural for education and could be the basis of interactive textbooks that could find their way into classrooms from elementary school all the way through college. But that won't happen for five to 10 years, van Dam says, because prices have to drop to about $1,000 for portable machines that schools can afford.

Although existing hypertext products fall short of their potential power, at least they are kindling wider awareness of the concept, van Dam says. "What is making hypertext finally start to bubble isn't really a hypertext system. But [Apple's] Hypercard is turning a lot of people on because it's snazzy and well-done," he says (see p. 63).

All three men are still at work on hypertext projects. Englebart, who retired last year from McDonnell Douglas, directs the Bootstrap Project, which he describes as a strategy for forging wide-area cooperative work. Key to its realization is his Augment hypertext system, which integrates mail, tables, programming, and documents.

Van Dam is lining up venture capital to launch Praxis, a Providence startup that will produce an electronic media system for technical documentation. And Nelson's Xanadu system will be released later this year initially for Sun Microsystems Inc. work stations. "It is an interconnection and history server that will revise the way that information is used in every field," he says.

STILL TO BE IRONED OUT are standards for hypertext. "No hypertext systems are compatible and they cannot swap information," says van Dam. Standards efforts are under way to bury link services within the operating system. That would enable writers of application software to build in hypertext capabilities.

Further down the road, van Dam would like to see user-controlled animation—stored models that can animate themselves under user control. "What I want is the Crayola—a graphics supercomputer—the marriage between a supercomputer and a multimillion-dollar flight simulator," he says. "During the '90s, it will fit in a work station and sometime later in a laptop."

And he still has lofty goals for future computers: "Computers of the future will have to adjust to the fact that people think in terms of moving images rather than still-lifes," he says. "I want the computer to model these objects, both real and imaginary, and then simulate the behavior of these objects, ranging from individual molecules to an automobile engine or a nuclear power plant."

Hypertext would then be a part of an interactive multimedia environment. Van Dam's ideal system would allow him to "walk through or around this object or structure or at any level of detail and at any speed." E

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MULTIMEDIA MOVES IN AND COMPUTER GIANTS MAP THEIR STRATEGIES

PAGE 40